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**IAP20 Rec'd PCT/PTO 15 FEB 2006**

**PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of MARIONI

Application No.

Examiner:

Filed: Herewith

Group Art Unit:

For: ELECTRONIC CONTROL DEVICE FOR A SYNCHRONOUS PUMP

**SUBMISSION OF COPY OF ANNEXES TO INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY**


Mail Stop PCT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Please find attached a copy of the Annex to the International Preliminary Report on Patentability. Please note that these claims are for informational purposes only, as they are amended in the enclosed preliminary amendment.

Respectfully submitted,

Dated: 2-15-06

  
Mark D. Passler  
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Docket No. 7202-107

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of MARIONI

Application No.

Examiner:

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For: ELECTRONIC CONTROL DEVICE FOR A SYNCHRONOUS PUMP

**SUBMISSION OF ARTICLE 19 AMENDMENT**

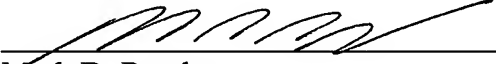
Mail Stop PCT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Please find attached a copy of the Article 19 Amendment. Please note that these claims are for informational purposes only, as they are amended in the attached Preliminary Amendment.

Respectfully submitted,

Dated: 2-15-06

  
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Docket No. 7202-107

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- 1 -

## CLAIMS

1. A electronic driving device (20) for turning on and off a synchronous pump comprising a synchronous electric motor (1) with a permanent-magnet rotor (8), comprising:
  - 5 - at least a static power switch (17) inserted in series between the motor (1) and an AC electric power supply source ( $V_p$ ); and
  - a processing unit (16) having at least an input receiving a synchronism signal ( $V$ ) and a control output connected to said switch (17);
  - characterised in that it is enabled by a signal emitted by a float level
    - 10 sensor (40) and includes an input receiving a signal ( $\alpha$ ) by a position sensor (21) detecting the rotor (8) polarity and position;
    - the pump turn-on and off being regulated according to the signal emitted by said level sensor (40) and to a measured difference between a critical load angle ( $\delta$ ) and a current load angle computed during different
      - 15 working conditions of the pump.
2. A device according to claim 1, characterised in that said position sensor (21) is a Hall-effect sensor.
3. A device according to claim 1, characterised in that the motor comprises rotor poles (N, S) divided by an ideal plane (9) whose rest
  - 20 position is orthogonal to the position of said position sensor (21).
4. A device according to claim 1, characterised in that said float level sensor (40) comprises a Hall probe (37).
5. A device according to claim 1, characterised in that the float (36) of said
  - 25 level sensor (40) is incorporated in an envelope (31), externally associated with the body (25) of the pump (15) and the sensor element (37) of said level sensor (40) is housed in the pump body (25) in correspondence with said float (36).
6. A device according to claim 5, characterised in that said float (36) is equipped in its lower part with a permanent magnet (29).

- 2 -

7. A device according to claim 1, characterised in that said pump (15) is an immersion pump.
8. A device according to claim 1, characterised in that said electronic device (20) is housed on an electronic board (38) positioned inside the pump body (25) in a position just underlying the float level sensor (40).
9. A device according to claim 1, characterised in that said phase displacement is indirectly measured in said unit (16) by detecting the rotor inductance, by means of said sensor (21), being complementary to the back electromotive force.
10. 10. A device according to claim 1, wherein the pump is immediately turned off if the value of a counter (T2) is greater than a predetermined time limit (Te) defined for an emergency stop.
11. A device according to claim 1, wherein said critical load angle ( $\delta$ ) is a mean value among N sampled values.
- 15 12. A device according to claim 1, characterized by a first time counter (T1) that is incremented every time instants wherein the float level sensor is low and the pump is off to check the inactivity time period of the pump and turn it on for a predetermined short time period.

## AMENDED CLAIMS

[received by the International Bureau on 04 April 2005 (04.04.05);  
claim 1 amended, claims 2-12 unchanged]

## CLAIMS

1. A electronic driving device (20) for turning on and off a synchronous pump comprising a synchronous electric motor (1) with a permanent-magnet rotor (8), comprising:
  - 5 - at least a static power switch (17) inserted in series between the motor (1) and an AC electric power supply source (Vp); and
  - a processing unit (16) having at least an input receiving a synchronism signal (V) and a control output connected to said switch (17);
  - characterised in that it is enabled by a signal emitted by a float level  
10 sensor (40) and includes an input receiving a signal ( $\alpha$ ) by a position sensor (21) detecting the rotor (8) polarity and position;
  - the pump turn-on and off being regulated according to the signal emitted by said level sensor (40) and to a measured difference between a critical load angle ( $\delta$ ) and a current load angle computed during different  
15 working conditions of the pump.
2. A device according to claim 1, characterised in that said position sensor (21) is a Hall-effect sensor.
3. A device according to claim 1, characterised in that the motor  
20 comprises rotor poles (N, S) divided by an ideal plane (9) whose rest position is orthogonal to the position of said position sensor (21).
4. A device according to claim 1, characterised in that said float level sensor (40) comprises a Hall probe (37).
5. A device according to claim 1, characterised in that the float (36) of said  
25 level sensor (40) is incorporated in an envelope (31), externally associated with the body (25) of the pump (15) and the sensor element (37) of said level sensor (40) is housed in the pump body (25) in correspondence with said float (36).
6. A device according to claim 5, characterised in that said float (36) is equipped in its lower part with a permanent magnet (29).

7. A device according to claim 1, characterised in that said pump (15) is an immersion pump.
8. A device according to claim 1, characterised in that said electronic device (20) is housed on an electronic board (38) positioned inside the pump body (25) in a position just underlying the float level sensor (40).
9. A device according to claim 1, characterised in that said phase displacement is indirectly measured in said unit (16) by detecting the rotor inductance, by means of said sensor (21), being complementary to the back electromotive force.
- 10 10. A device according to claim 1, wherein the pump is immediately turned off if the value of a counter (T2) is greater than a predetermined time limit (Te) defined for an emergency stop.
11. A device according to claim 1, wherein said critical load angle ( $\delta$ ) is a mean value among N sampled values.
- 15 12. A device according to claim 1, characterized by a first time counter (T1) that is incremented every time instants wherein the float level sensor is low and the pump is off to check the inactivity time period of the pump and turn it on for a predetermined short time period.